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Three new species and genera of Dilepididae (Cestoda, Cyclophyllidea) from neotropical Picidae (Aves).

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Three new species and genera of Dilepididae (Cestoda, Cyclophyllidea) from neotropical Picidae (Aves). – The three new genera testify a high diversification of cestodes from Piciformes (Picidae) in South America, reveal some new important characters and show how detailed a generic diagnosis has to be in order to emphasize differences and similarities in related genera. *Apokrimi* n. gen., a monotypical genus, differs from all other Dilepididae in its enormous "sucker-like" pseudoscolex cutting off the scolex. *Krimi* Burt, 1944 is the nearest genus to it as to anatomy and hosts; moreover, the swelling of the neck in some of its species seems to prelude the appearance of the pseudoscolex of *Apokrimi*, an extreme apomorphy. *Apoliga* n. gen. differs from all other Dilepididae in its atrio-genital complex: atrial cavity proper with long bristle-like spines, ductus masculinus well-defined, unarmed, cirrus with extremely long, strong, bristle-like spines. Diagnosis confirmed by 5 cogeneric species, observed in addition to the type species and not yet described. Highly specific of Picidae. *Monoliga* n. gen., a monotypical genus, is similar to *Liga*; it differs in the single hooks crown, ovary in the poral half of the medulla, cirrus pouch backward inclined in adult proglottides and other more subtle character states.

Key-words: Cestoda - Cyclophyllidea - Dilepididae - Birds - Taxonomy - Neotropic.

INTRODUCTION

Some cestodes of birds recently collected prove that in the neotropical region there is a very large number of yet unknown species. Moreover, interesting instances of a strict hostgroup specificity of the cestode genus and a wide diversification of cogeneric cestode species in a given family of birds emerge.

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The adopted generic diagnosis does not exactly follow the traditional scheme. Characters are dealt with in a different succession in order to help the identification, and the possible grouping of genera in higher taxa. More characters than in traditional diagnoses have been used and their description is much detailed. Owing to such diagnoses, genera have become more restrictive, which was necessary in the revision of Dilepididae we carried out (Bona, 1994, in press).

Out of the three new genera described here, *Apokrimi* and *Monoliga* are monotypical, whereas *Apoliga* consists of numerous new species which will be described elsewhere. The genera mentioned in the discussions were revised before comparing them with the new ones, by studying the original type and cogeneric species in old or recently collected material, except for *Ivritaenia* Singh, 1962, in whose case we had to keep to the literature. This is an important premise to the discussions because comparisons are made either with characters that are sometimes disregarded in old species descriptions and in generic diagnoses, or with emended characters.

Some of the described material comes from the Peruvian Amazon, some from the Argentine pampa; the former was gathered during an expedition in the Province of Madre de Dios (Perù) organized by the "Fonds Leopold III pour l'exploration et la conservation de la nature" (Belgium), and headed by Prof. Xavier Misonne (Brussels) and during another one in the Province of Loreto (Perù) with my colleague Dr. Claude Vaucher from the Museum of Natural History (Geneva); the latter, from Argentina, during a stay in the Province of Buenos Aires, through the support of Prof. José M. Gallardo, director of the Museo Argentino de Ciencias Naturales.

MATERIAL AND METHODS

Specimens were rapidly cleaned in tap water, fixed for 12-24 h. (or longer) in a solution of 5% mercury bichloride ($HgCl_2$) plus 7% formol, and stored until the end of the journey in 70° alcohol with addition of some drops of Lugol's solution, to remove the mercury salt. Then preserved in 70° alcohol. Stain was carried out with hydrochloric-acid carmine or very diluted Delafield haematoxylin, both differentiated in acidulate 70° alcohol (0,25% hydrochloric acid), transferred to tap water and mounted in Canada balsam. Hooks were mounted with the scolex in Canada balsam or squashed in modified Berlese fluid, slightly diluted to permit a better dispersion and flattening of the hooks (formula to avoid precipitates: dist. water 50 ml; chloral hydrate 200 gr; gum arabic pulv. 30 gr; glycerol 20 gr).

Measures in µm if not otherwise stated; measures or numbers in brackets added to an observed range are unusually low or high data.

Apokrimi n. gen.

DIAGNOSIS - Rostellar apparatus muscular, very delicate. Pouch very small, wall thin. Rostellum very small, normal shape. Hooks unknown. Strobila very small; neck

forming a huge, spherical, glandulo-muscular, sucker-like pseudoscolex cutting off the scolex. Scolex very small. Suckers proportionally large. Genital pores irregularly alternate, anterior. Genital ducts between (most commonly) or dorsal to excretory vessels, in the same strobila. Vagina posterior to cirrus pouch, in same horizontal plane. Uterus ventral, reticulate, then persistently labyrinthine. Eggs small; embryophore robust, outer coat reduced, adhering to embryophore. Genital atrium small; no ductus masculinus. Ovary with pronounced anterior and posterior indenture; short, clear isthmus; small lobules, compact. Vitellarium lobular, central. Testes numerous, small, postovarian. Cirrus pouch small, subspherical, wall thin; antero-poral to ovary. Cirrus short; fine bristle-like spines, in a small, narrow, straight bundle, slightly protruding beyond the pouch orifice when withdrawn. Vagina transverse, in front of poral ovarian lobe; orifice at the atrium bottom, posterior, near the male one; proximal part sinuous; wall thick. Seminal receptacle in the ovary anterior indenture; separated from vitellarium. Vas deferens median, farther on than ovary and seminal receptacle, lengthwise elongate; prostatic cells. In Piciformes, Picidae. Neotropical. Type species: *Apokrimi pseudoscolecis* n. sp.

Apokrimi pseudoscolecis n. sp. (Figs 1-7)

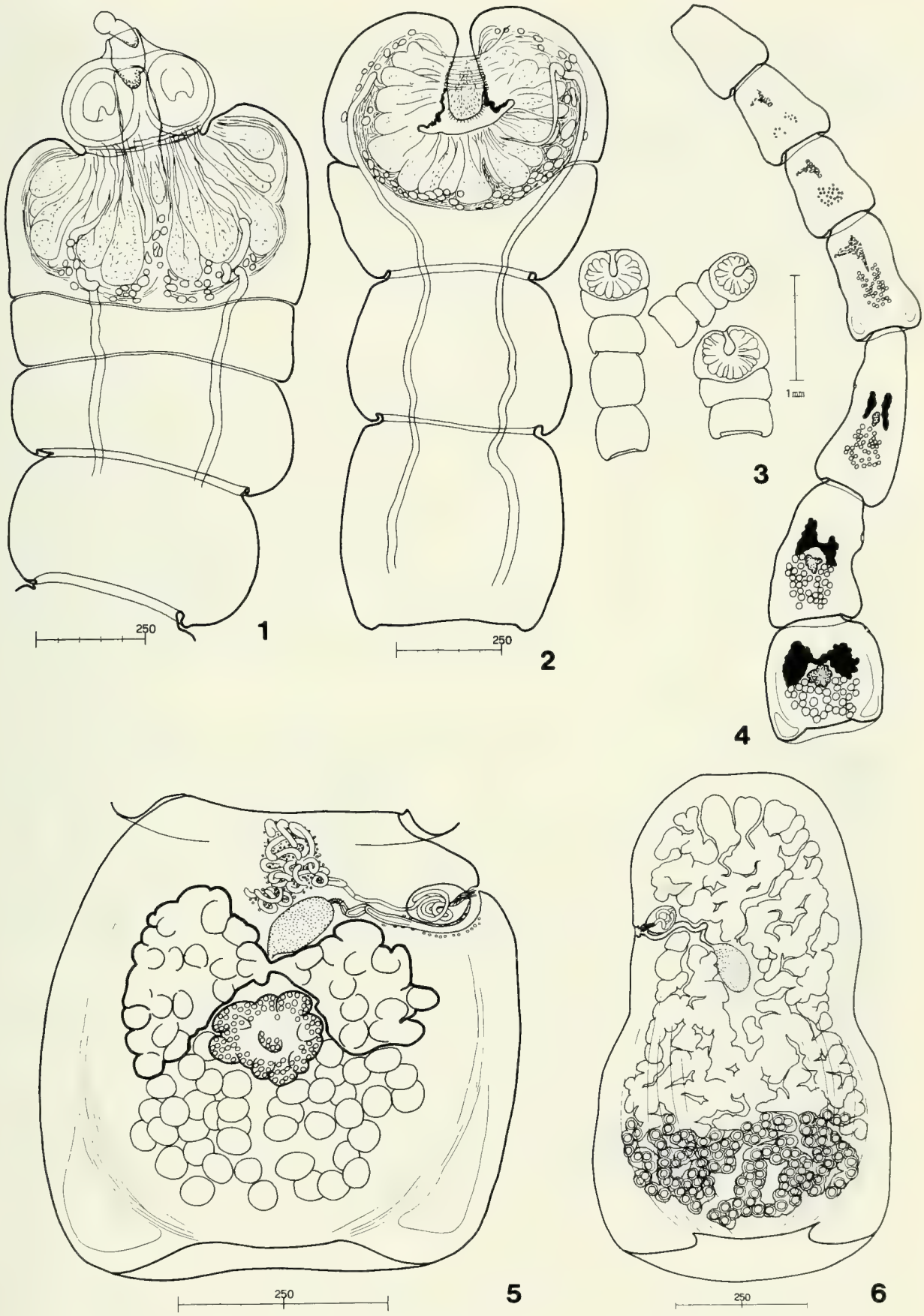
DESCRIPTION - Very small, thin, straight strobila; neck transformed into a big, spherical sucker-shaped pseudoscolex, beheading the strobila and substituting the scolex in its anchoring function. Proglottides slightly craspedote, longer than wide; adult ones trapeziform or rectangular with blunted corners; gravid ones much larger, long oval. First segment short, about as wide as the pseudoscolex. Proportionally long chain of juvenile segments followed by suddenly mature ones (semi-adult and adult proglottides, 2-3 in all); adult proglottides suddenly much larger than the preceding, semi-adult ones. Gravid proglottides detached early; there seems to be a precocious fissure between proglottides which hastens this process. Specimens at the same maturation degree can vary considerably in size of strobila and pseudoscolex. Pore anterior; organs not heaped; cortex scarce; longitudinal musculature weak, arranged like meridians round the medulla; excretory vessels sinuous even in stretched proglottides. Scolex very small, delicate; suckers very large with respect to scolex. Rostellum pouch very small, wall thin, glandular component not observed. Rostellum very small, musculature weak, but normally shaped, possibly armed, but hooks missing. The pseudoscolex consists of a swollen neck which pushes forward and forms a calix behind the scolex. Then the calix rim infolds, takes the shape of a "sucker", contracts and finally stretches and rips the peduncle that still kept the scolex attached. The cavity of the pseudoscolex is more like a longitudinal fissure and the rim seems to work like pliers having lateral lips.

Genital pores irregularly alternate. Genital ducts between (most common) or dorsal to excretory vessels, in the same strobila. Vagina, with respect to cirrus pouch, posterior and in same horizontal plane, or indifferently a little ventral or dorsal.

Uterus ventral, first finely reticulate, then persistently labyrinthine with irregular tubes; wall thin but firm; no uterine capsules are formed (anyway fully gravid proglottides are not available). Eggs small, numerous; embryophore fairly robust, outer coat delicate, reduced, at the end adhering to embryophore; no polar processes. Genital atrium simple, wall hardly noticeable, with a delicate sleeve of circular fibres near the bottom, thus forming a small cavity in front of the sexual orifices; no ductus masculinus. Ovary clearly bilobed, isthmus thin; deep anterior and posterior indenture; lobes symmetrical, at times lengthwise elongate, pointed at the anterior and posterior ends; lobules small, subspherical, thick; outline not deeply lobulate; pre-equatorial, surrounding laterally the vitellarium; just reaching excretory vessels but far from the anterior margin of the proglottis; in young proglottides, partly reticulate. Vitellarium rather large, central, lobulate, irregular in outline; in the posterior indenture of the ovary. Testes numerous, in a varying number, rather small, postovarian; clear field, close to ovary and vitellarium, not overlapping them. Cirrus pouch small, subspherical or oval, transverse; wall thin; reaches, sometimes crosses the excretory vessels; antero-poral with respect to the ovarian lobe; heaped, small cells in its distal third. Cirrus short, delicate; limited to a small, narrow, straight, homogeneous bundle of fine bristle-like spines, when withdrawn; after the terminal narrowing of the withdrawn cirrus, a part of the internal vas deferens seems to bear very thin setae. Vagina transverse, curved along the posterior rim of the cirrus pouch and in front of the ovarian lobe, at times sinuous or even coiled before seminal receptacle; longer than cirrus pouch; probably very thin setae in its distal part, proximal end dilatable; orifice posterior, at the atrium bottom, just in front of the male one, so that there is no ductus masculinus; wall rather thick, cellular, with fine annular fibres, forming a noticeable sleeve before the seminal receptacle. Seminal receptacle median, in the anterior indenture of the ovray, diagonal axis, separated from the vitellarium. Internal vas deferens long, with convolutions in the proximal half of the pouch; lumen rather wide, regular. Vas deferens median, anteriorly isolated, lengthwise elongate; in front of the seminal receptable, reaching the anterior margin of the proglottis; widespread, fairly thick prostatic cells.

Numerical data

Strobila, excluded gravid proglottides, always detached, 4,5-6,5 mm; 13-15 proglottides; Adult proglottis, in large strobilae 945-990x636-509 (preceding semi-adult segment, width only 172-190); in small strobilae 709x500 (preceding semi-adult segment, width only 136); Scolex width 194 (n=1); Rostellum pouch 72 x 43; Rostellum 58-60x20 (stem), 27 (apical pad); Suckers 86-102x74-95; Hooks unknown; Pseudoscolex, after scolex was cut off, 190-275x346-395 (n=6); Pseudoscolex, depth of the groove, 97-134 (n=6); Cirrus pouch 74-97x52-56 (n=6); Cirrus withd rawn, bundle of bristle-like spines, (30)34-38x6-7,5 (n=6); Testes (32)37-47(51) (n progl. =15), diam. 35-52x29-46 (n=30, in several proglottides); Genital atrium, depth 35-45; Ovary (254)282-346x236-388 (n=5);



FIGS 1-6

Apokrimi pseudoscolecis n. gen., n. sp.: 1, scolex before beheading, initial stage of pseudoscolex; 2, pseudoscolex after beheading, "sucker-like"; 3, pseudoscoleces of different sizes, the most common aspect in a population; 4, strobila, long fragment, without anterior segments and gravid proglottides; 5, adult proglottis, slightly contracted; 6, gravid proglottis, labyrinthine uterus.

Available material: 4 complete strobilae without gravid proglottides, several loose gravid proglottides; 1 scolex, several pseudoscoleces. Specimens still moving 9 hours after death of the host!

Host: *Phloeoceastes melanoleucos* (Gmelin, 1788) ♂ (Picidae)

Locality: Rio Samiria, Province of Loreto, Peru; 29-10-1980

Site of infection: first 1/5 of the intestine.

Collection sample n° 160. Holotype and paratypes at the Museum d'Histoire naturelle of Geneva (Switzerland), MNHG 980.630-631.

Discussion

The most similar and probably phylogenetically related genus, to which *Apokrimi* has to be compared, is *Krimi* Burt, 1944 (Figs 8-9). It has to be stated beforehand that *Krimi*, even if the make up of the genus has to be wholly revised, is valid, and different from *Choanotaenia* Railliet, 1896 and *Liga* Weinland, 1857, even though Spasskaya & Spasskii (1971) considered *Krimi* synonymous with *Liga* (see emended generic diagnoses in Bona, 1994, in press). It is somewhat difficult to distinguish *Krimi* from both these genera, but our opinion is supported by the revision of the original type material of *infundibuliformis* Goeze, 1782, (Fig. 10), the true revalidated type species of *Choanotaenia* (different from *infundibulum* Block, 1779 which will be redescribed elsewhere), and of the genus *Liga* on its whole (first note; Bona & Bionaz 1990).

The anatomy of *Apokrimi* (even details concerning genital atrium, ovary, cirrus armature, uterus and eggs), the pattern of maturation, the habitus of strobila and proglottides, and additionally the host group (Picidae) are identical with those of *Krimi*. Its South American provenance corresponds to an area where the genus *Krimi* has greatly differentiated (unpublished observations), and supplies indications of progressive change in some characters, in different species. The reduction in size of the hooks or the swelling of the neck, preludes the appearance of extreme character states, surely apomorphic, namely the disappearance of hooks (but not of the rostellum itself) in a few species and the formation of the huge pseudoscolex in *Apokrimi*. The presence of the pseudoscolex, the only instance known in Dilepididae, justifies the erection of a new genus, in order to emphasize such an extraordinary structure.

A pseudoscolex was mentioned among Dilepididae in *reductorhyncha* (see Spasskaya, 1957 and 1959), type species of *Emberizotaenia* Spasskaya 1970, a totally different genus, because of the particular swelling its neck sometimes under-

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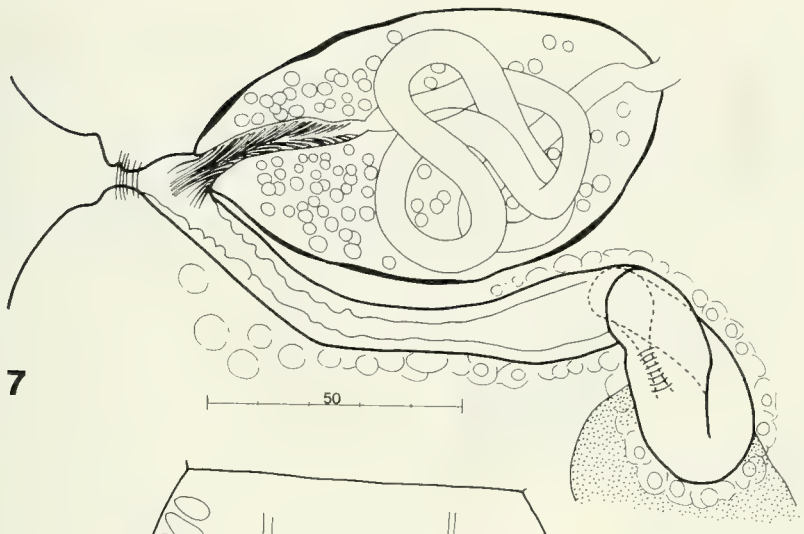
Figs 7-9

Apokrimi pseudoscolecis n. gen., n. sp.: 7, detail of atrium, cirrus pouch, cirrus and vagina. *Krimi chrysocolaptis* Burt, 1944. Type. Nat. Hist. Museum (London) n° 1983-7-12-1.: 8, adult proglottis; 9, strobila with swollen neck.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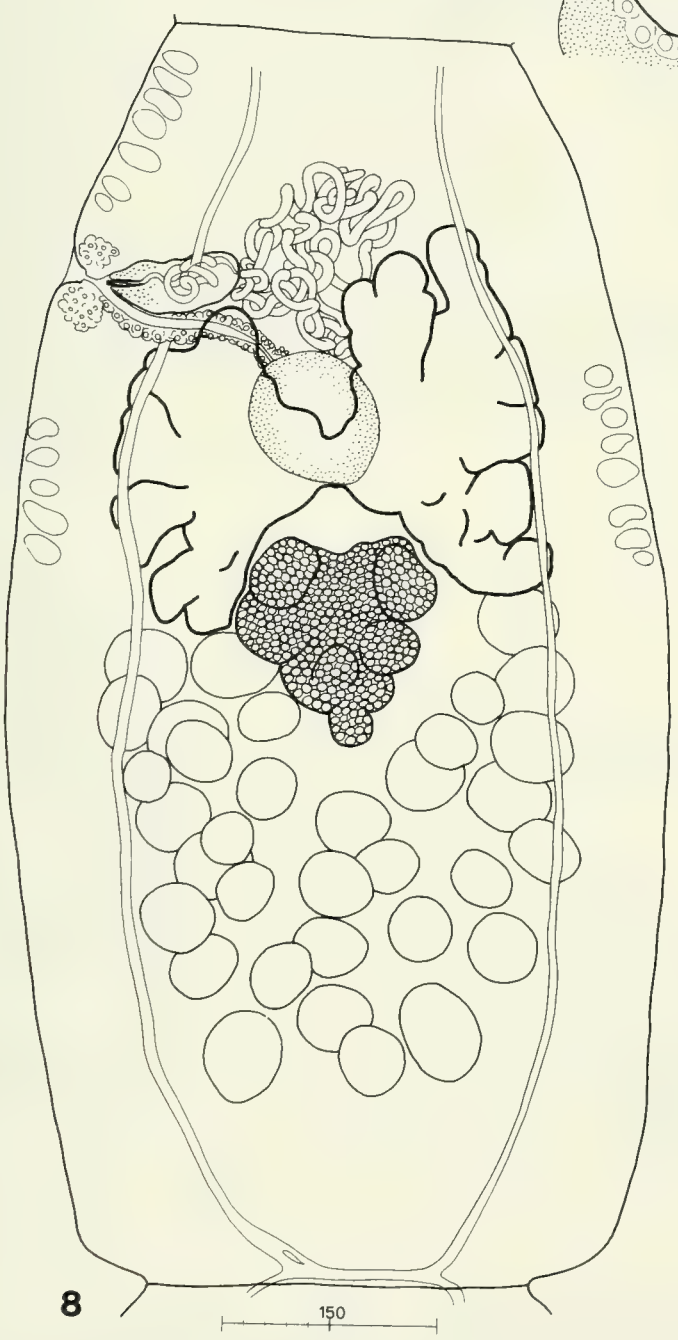
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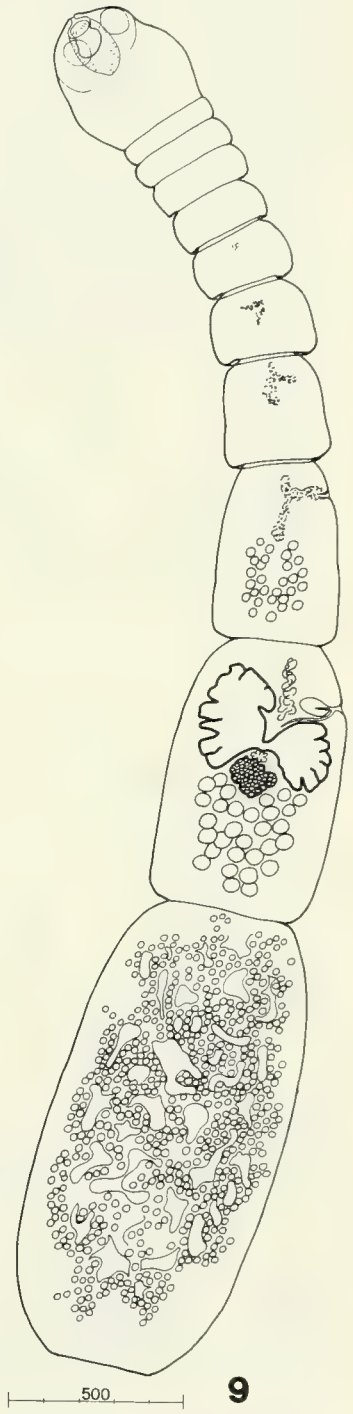
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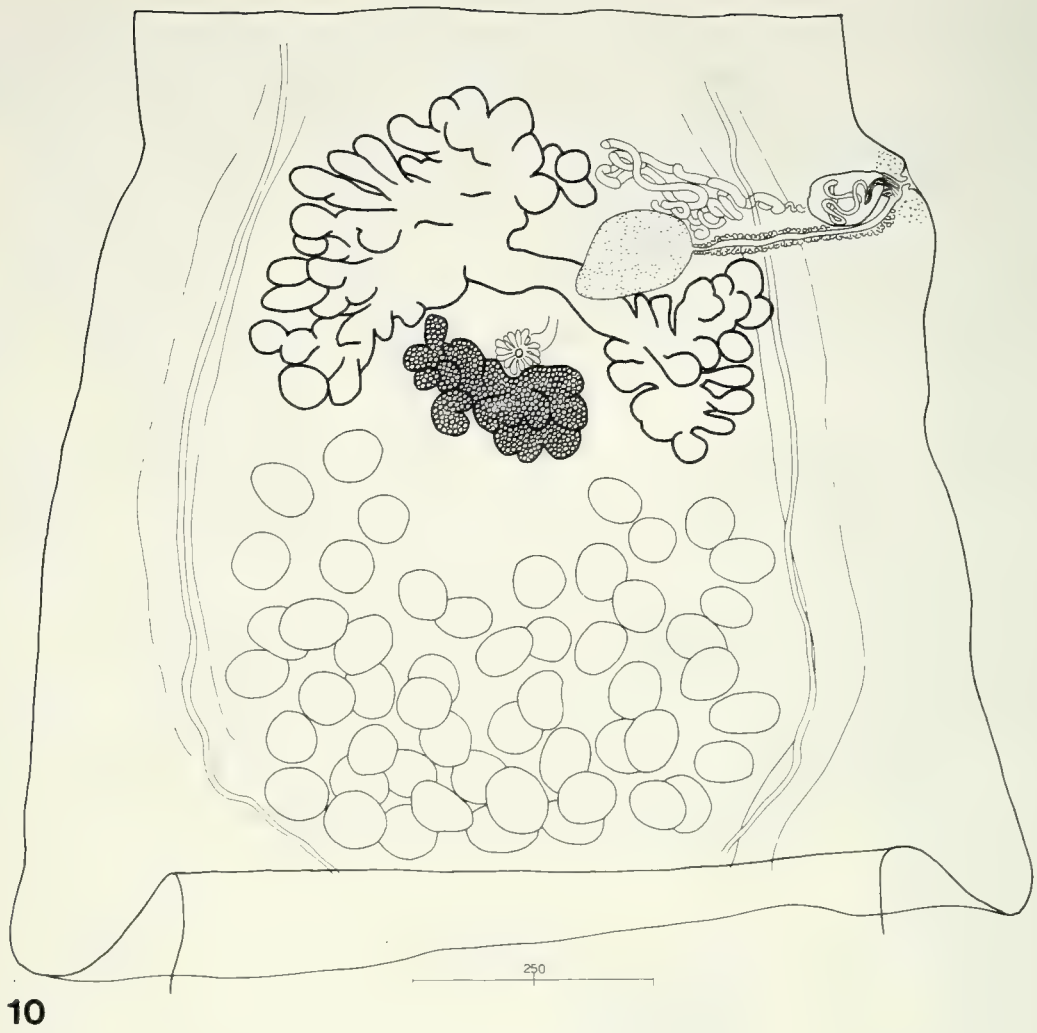


FIG. 10

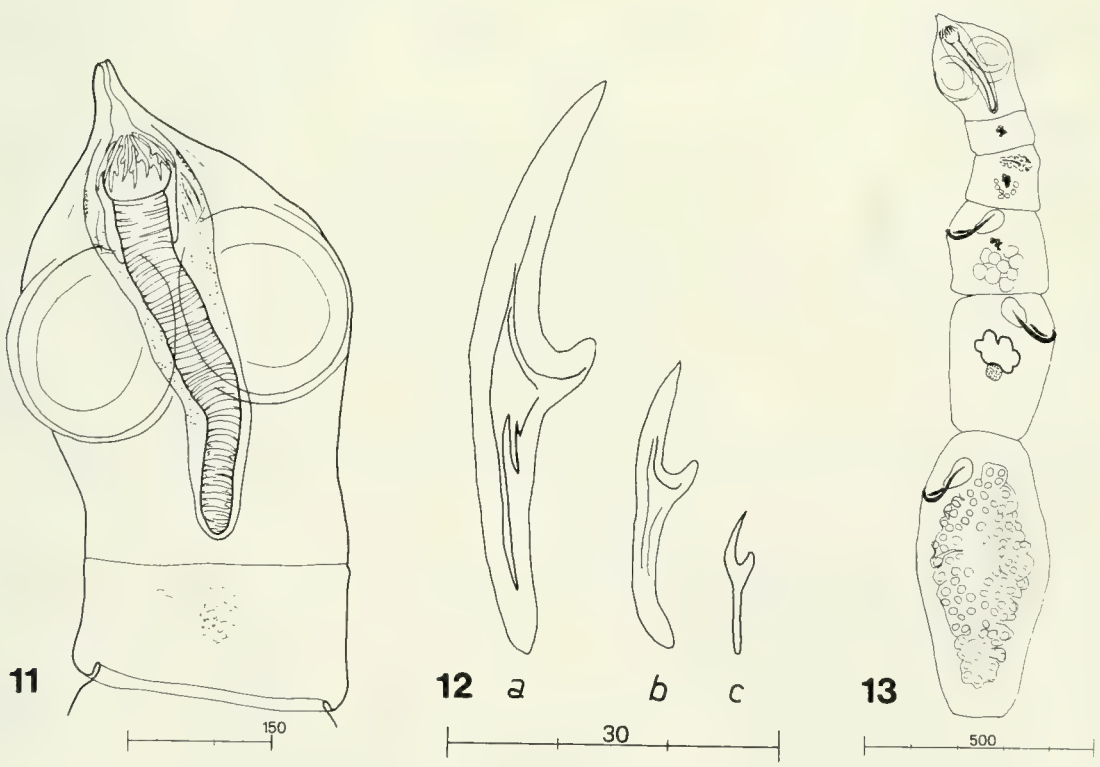
Choanotaenia infundibuliformis (Goeze, 1782). Revalidated as type species of the genus. Original material of the type preserved in alcohol. Goeze's collection, vial n° 264, from the Institute of Zoology, University of Pavia (Italy). Adult proglottis.

goes. In such instances, like in species belonging to other genera (*Unciunia* Skrjabin, 1914), the neck is actually much swollen, and subtegumental glands may appear in it. This swelling however, has no constant aspect and structure of its own. Such a neck cannot be considered as a pseudoscolex, because it does not take the place of the scolex. Anyway, as we saw in *Krimi*, the simple swelling of the neck is perhaps an intermediate character state between a normal neck and a true specialized pseudoscolex, and is worth mentioning in a generic diagnosis.

Apoliga n. gen.

DIAGNOSIS - Rostellar apparatus musculo-glandular. Pouch very long, far beyond suckers. Rostellum long, narrow, rivet-shaped, at times wider, stronger. Hooks in 2 circles (20). Strobila extremely small (0,4-2,3 mm), stiff; proglottides very few, hardly craspedote, poral side slightly bulging, producing a little, alternate, side-

ways shifting of the proglottides along the strobila, gravid ones much larger, long oval; usually clearly proterandrous, testes get much smaller or disappear when ovary fully ripe; cortex wide. Genital pores regularly alternate. Genital ducts dorsal, to excretory vessels. Vagina posterior to cirrus pouch, in same horizontal plane. Uterus labyrinthine with large pouches, then sacciform, tightly septate; wall persistent, at times adhering to eggs, simulating uterine capsules. Eggs rather scarce; embryophore strong; outer coat large, often shrivelled amongst eggs. Genital atrium very deep, forwards inclined; ductus masculinus well-defined, firm-walled, spineless; atrium proper (distal part to the vagina orifice) with bristle-like spines; just before pore, on its anterior face, one or two characteristic folds with modified tegument. Ovary bilobed, small; few, close lobules; central, far from anterior margin of proglottis. Vitellarium small, subspherical, smooth, central. Testes few (8-12), posterior, at times also lateral and partly dorsal to ovary (exceptionally an antero-aporal element). Cirrus pouch spherical or elongate oval, wall firm; deep into the parenchyma, anterior, transverse or forwards inclined. Cirrus short; very long, bristle-like spines in a forwards bent bundle, largely engaged in the atrium when organ withdrawn. Vagina short, very sinuous; vagina and cirrus pouch divaricate. Seminal receptacle oval, usually between ovarian lobes; axis inclined or longitudinal; farther back than the cirrus pouch. Vas deferens lengthwise elongate, median and in front of the aporal lobe, posterior and medial to cirrus pouch. In Piciformes, Picidae. Neotropical. Type species: *Apoliga imperialis* n. sp.

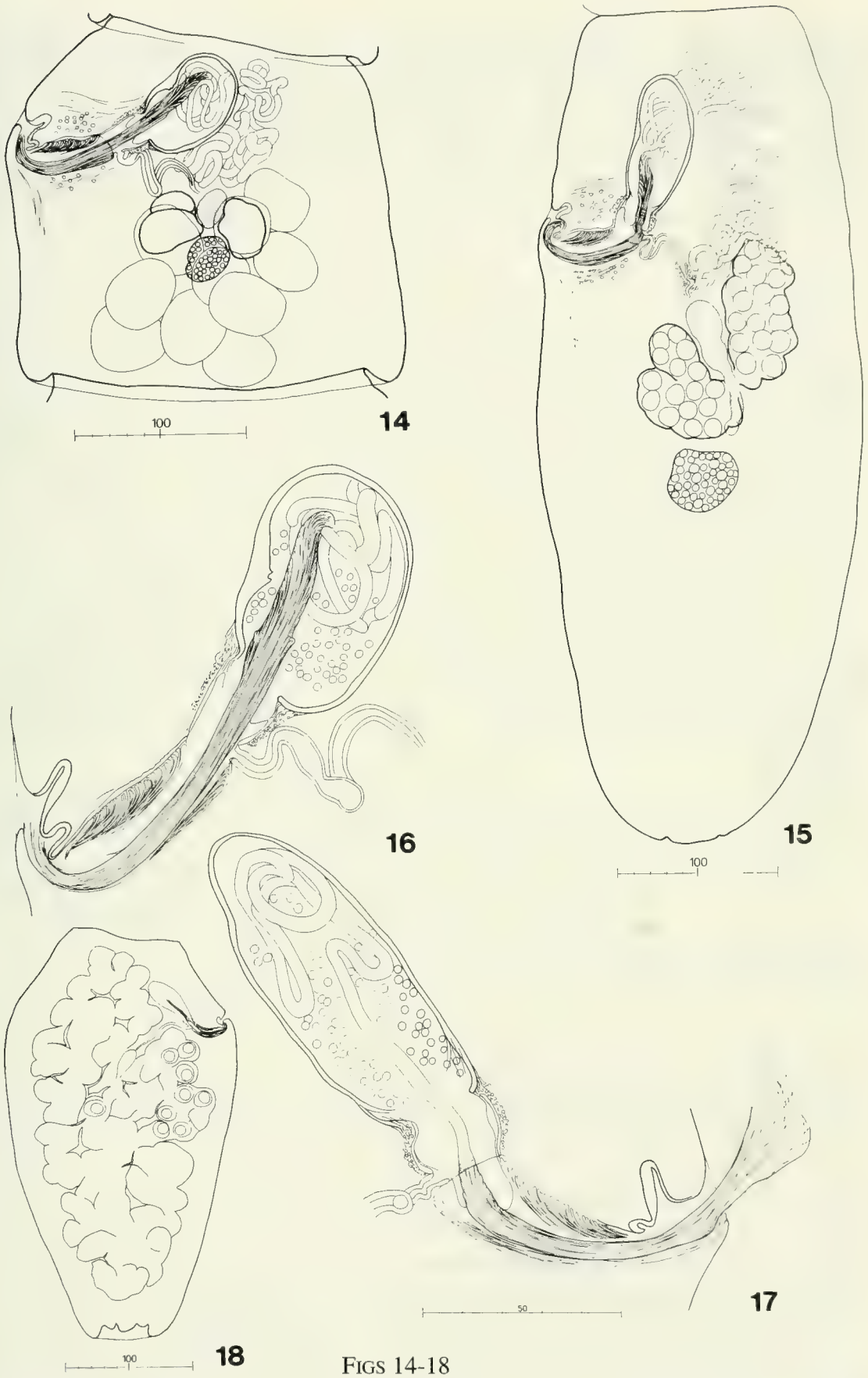


FIGS 11-13

Apoliga imperialis n. gen., n. sp.: 11, scolex; 12, hooks of *imperialis* (b), *Apoliga* sp. I (a). *Apoliga* sp. II (c); 13, strobila with its gravid proglottis.

Apoliga imperialis n. sp. (Figs 11-17)

DESCRIPTION - Strobila extremely small, thin, rather stiff; neck short, wide; segmentation very neat from the beginning; markedly proterandrous, testes early ripe, when ovary still very small (adult male proglottis), and effaced when ovary ripe (adult female proglottis), leaving empty the posterior part of the proglottis; only 1 male, 1 female adult proglottis and 1 gravid proglottis per strobila. Proglottides slightly craspedote, male one about as wide as long, female one much longer than wide, often oval; poral side slightly longer and bulging, so that the strobila shows a typical, alternate, slightly lateral shifting of the proglottides; cortex wide, anatomy clear. Scolex tapering, suckers relatively large. Rostellar apparatus musculo-glandular, with reduced glandular component; glands not visible in the rostellum proper. Pouch very long, narrow, reaching far beyond suckers, wall thin; anterior external cavity deep round the distal part of the retracted rostellum (common aspect in *Apoliga* species having a long, narrow rostellum). Rostellum long; stem narrow, apical pad small; rivet-shaped. Hooks in 2 circles, regular (20), no differences between the two crowns: blade fairly shorter than handle. Genital pores regularly alternate. Genital ducts dorsal to excretory vessels. Vagina posterior to and in same horizontal plane as cirrus pouch. Uterus and eggs: see generic diagnosis and fig. 18. Genital atrium deep, complex; wrapped up in a large, transparent, spherical mass of nuclei and spaced meridian fibres, reaching the poral extremity of the cirrus pouch; just preceding the pore, in the anterior face, 2 superficial folds with thickened modified tegument, the distal one larger; atrium cavity, between distal folds and vagina orifice, with very long spines, stronger on the anterior face, where a well-outlined "brush" is formed, thinner, squeezed between wall and the long cirrus bristles, on the posterior face, becoming at times difficult to observe; proximal end of the cavity prolonged into a ductus masculinus – the vagina orifice being more distal than the orifice of the cirrus pouch – spineless, wall strong, annular fibres, and connected to the wall of the cirrus pouch; on a level with the distal folds, 2 delicate muscular bundles, one directed backwards and most evident, one forwards, both parallel to proglottis surface. Ovary bilobed, very small; few eggs; thin isthmus, deep anterior idenure; hardly lobulate when ripe, inclined axis with aporal lobe more in front; central. Vitellarium small, subspherical, smooth, central, clearly separated from ovary. Testes few, posterior, lateral and dorsal to ovary, disappearing when ovary fully ripe. Cirrus pouch subspherical or oval, deep in the parenchyma, reaching the median line, forwards inclined, at times nearly longitudinal when ovary fully ripe, far in front with respect to ovary and seminal receptacle; wall fairly contractile, size very variable, not necessarily in relation with cirrus evagination; contracted wall particularly firm, refracting, showing a longitudinal striation. Cirrus short, wide; very long, fairly stiff, bristle-like spines in a thick bundle, decidedly longer than the cirrus pouch, reaching the genital pore even when cirrus withdrawn, absent at the base of evaginated organ; wall thin, deformable, often very close to the wall of the ductus masculinus. Vagina shorter than cirrus pouch, sinuous, with a posterior, at times elongate loop in front of the ovarian poral lobe; wall firm; vagina and cirrus pouch divaricate. Seminal receptacle rather small, axis



FIGS 14-18

Apoliga imperialis n. gen., n. sp.: 14, adult proglottis, male, ovary still very small; 15, adult proglottis, female, testes already effaced; 16, atrio-genital complex, totally withdrawn cirrus; 17, atrio-genital complex, partly evaginated cirrus. *Apoliga* sp. II: 18, gravid proglottis uterus stage between labyrinthine with large pouches and sacciform septate.

longitudinal; in the anterior indenture of ovary, decidedly posterior to cirrus pouch. Internal vas deferens much coiled in the posterior half of the pouch; lumen regular, narrow. Vas deferens median, lengthwise elongate, nearly reaching the anterior margins of the proglottis, in front of the ovary aporal lobe, when ripe; main mass close to posterior rim of cirrus pouch, that can be nearly longitudinal in long, female proglottides.

Numerical data

Strobila 1,4-1,6 mm (n=3); 4-5 proglottides; Adult proglottides (258)274-502(574)x(171)198-342 (n str.=8, n progl.=8); Scolex, width 175-217 (n=6); Rostellum pouch 165-220x57-76 (n=6); Rostellum (171)179-220x25-34 (stem), 36-46(apical pad) (n=6); Suckers 68-103x68-95 (n scol.=6); Hooks, 20 (n.scol.=4); length in both circles, 27-28(29), blade (l) 9-10, handle (m) 19-20, l/m 0,481-0,500 (n scol.=2, n hooks=7); Genital atrium, length of the ductus masculinus 17-29 (n str.=9, n progl.=17); Genital atrium, length of the anterior "brush" of long spines (31)34-48 (n str.=9, n progl.=17); Cirrus pouch (55)60-96x36-50 (n str.=9, n progl.=17); Cirrus withdrawn, bundle of bristle-like spines (101)110-134 (n str.=9, n progl. n=17); Testes 8-9 (n str.=10, n progl.=12), diam. 32-41 (43) x 29-38 (n = 20, n str. 6); Ovary, width 96-168(180) (n str.=8, n progl.=8); Vitellarium, largest diameter 46-47 (n str.=8, n progl.=8); Seminal receptacle, length 41-72 (n str.=8, n progl.=8);

Host: *Chrysoptilus melanolaimus* (Malherbe, 1857) [the synonymity with *C. melanochlorus* (Gmelin, 1788) is still under discussion].

Locality: Monte, Province of Buenos Aires, Argentina; 28-9-1982.

Site of infection: intestine, mixed with another *Apoliga* sp.

Holotype and paratypes at the Muséum d'Histoire naturelle of Geneva (Switzerland), MNHG 982.1859; 1861.

Discussion

Apoliga differs from all other genera of Dilepididae particularly in the structure of the atrio-genital complex and its kind of spinosity. However, a comparison with few other genera must be made. If we take into account only a few important traditional characters (number of hooks circles, position of genital pores, position of genital ducts, uterus) we would not be able to tell *Apoliga* from *Liga*. Moreover, the two genera have the same host group, are even found in the same host, and both show a large diversification of neotropical species.

Apoliga differs from *Liga* (see Figs 25-26) as follows: last adult proglottis (ripe ovary) longer than wide, pronounced proterandrous maturation, smaller testes number [8-12, instead of (9)14-25], atrium proper deep, forwards directed, heavily spined, ductus masculinus strong and spineless, bundle of bristle-like spines of the cirrus stiff, very long, engaged, when organ withdrawn, in the whole atrial cavity, vagina very sinu-

ous, vagina and cirrus pouch divaricated, main mass of vas deferens along the posterior rim of the cirrus pouch (rather than in front of the pouch), seminal receptacle roundish or lengthwise elongate (instead of transverse), situated in the anterior indenture of ovary.

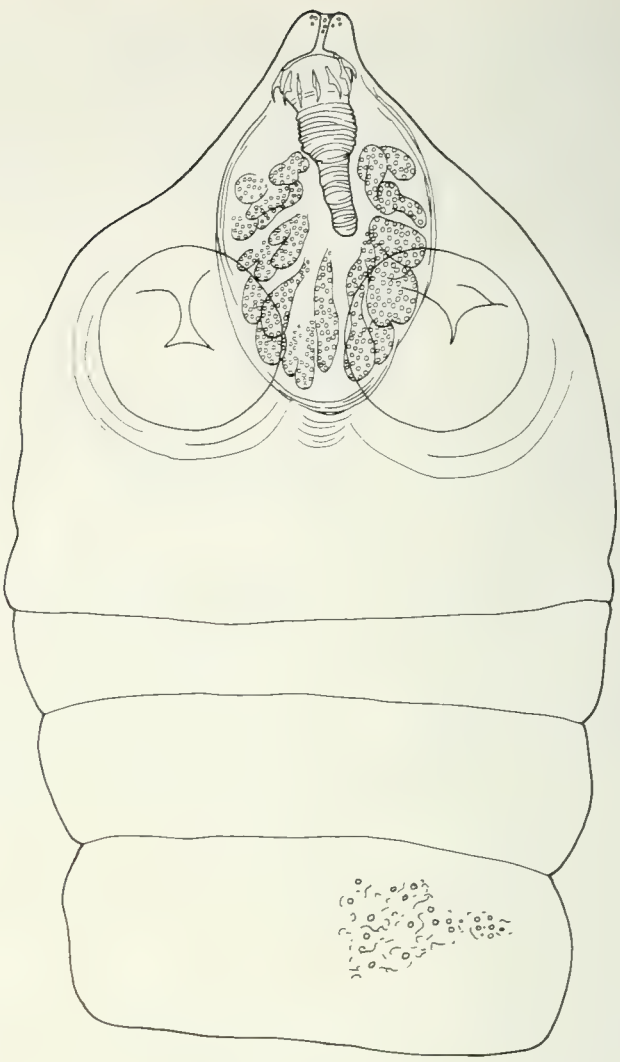
As to *Chitinorecta* Meggitt, 1927 and *Dictymetra* Clark, 1952, the structure and spinosity of the atrio-genital complex (including the ductus masculinus) and some other important characters are different, as resulting from a revision of the two genera whose diagnoses were, emended (Bona, 1994, in press).

Some notes must be added, taking into account also 5 other new species of *Apoliga*, often mixed, we were able to examine. The protandry, with a pronounced regression or disappearence of testes when the ovary reaches ripeness, occurs in 4 out of the 6 known species and proves to be an interesting physiological character; in the 2 species where it is less accentuated, testes only get smaller in the adult female proglottis, without disappearing. In such a case, even the appearance of the uterus is more gradual, with the interposition of a semi-gravid proglottis between the female adult one and the fully gravid one (in the other species the gravid proglottis suddently appears at a stage of advanced maturation of the uterus, immediately after the female adult one). Proglottides number in a strobila, from 5 to 8. Excretory vessels thin, often very sinuous even in wholly extended proglottides. Sometimes the genital pore seems to be partially covered with a posterior flap of the proglottis wall. When the cirrus is withdrawn, only a small part of the bundle of bristle-like spines sinks into the pouch, the remaining part being external to the pouch, inside the ductus masculinus and atrium. Cirrus spines are rather apical (better seen in evaginated cirri), leaving a smooth, unarmed proximal part of different lengths according to species. Base of evaginated cirrus at times swollen, filling the whole ductus masculinus, getting close to its wall and hindering a neat distinction among ductus, cirrus and, consequently, cirrus pouch. Vagina orifice usually very narrow. The 2 fine muscular bundles round the atrium near the pore, an apparently unimportant character, can be observed in every species of *Apoliga*.

These 5 species fit perfectly into the diagnosis made on the basis of the type species, and confirm its validity. They show the high homogeneity of such clearly outlined genera and the constant appearance, in every species, of character states that traditional diagnoses either do not take into account, or do so only incidentally, as such characters are not usually considered valid on the generic level. It is also worth observing how the six species, inside such a rigid and restrictive diagnosis, differ from each other.

Monoliga n. gen.

DIAGNOSIS – Rostellar apparatus weakly muscular, glandular. Pouch oval, wall thin. Rostellum small, stem narrow, apical pad well-defined. Hooks in 1 circle, few (12-14). Strobila very small, brittle; no neck; proglottides hardly craspedote, much wider than long, often crescent-shaped, anterior concavity; pore anterior. Scolex wide, posteriorly not well-defined. Genital pores regularly alternate. Genital ducts dorsal to excretory vessels. Vagina posterior, proximal course mainly ventral, to cirrus pouch. Uterus closely labyrinthine; eggs end in the parenchyma. Embryophore thin, outer



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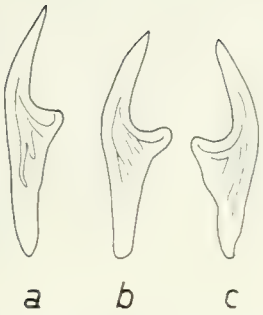

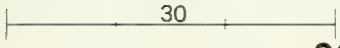

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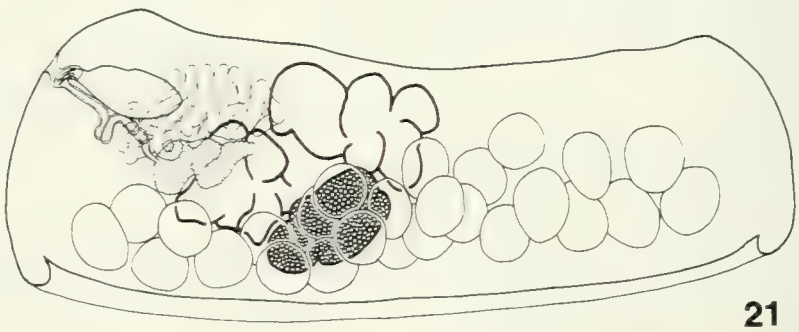

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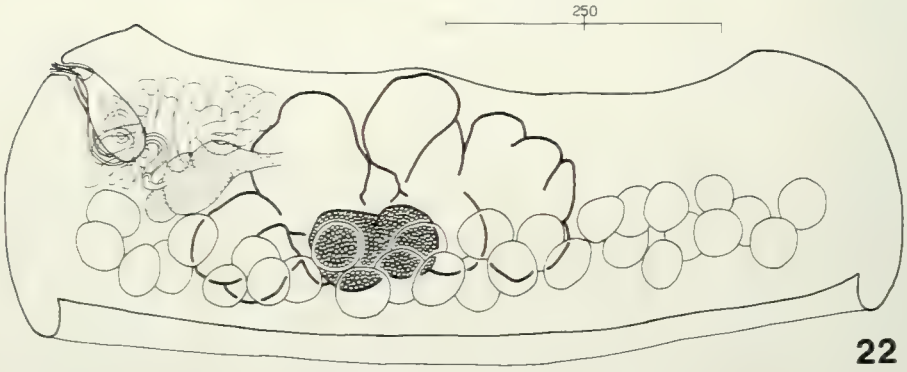

22

coat hardly developed. Genital atrium simple, unarmed; extremely reduced ductus masculinus. Ovary bilobed, large, bulky; lobules few, large; nearly wholly in the poral half of the medulla when ripe. Vitellarium in the back, in the posterior indenture of the ovary; lobules large. Testes numerous, postovarian, dorsal to vitellarium and partly to ovary; field transverse, more extended aporally to ovary. Cirrus pouch small, oval; wall thin; much backward inclined in adult proglottides. Cirrus short; armed with long, bristle-like spines, engaged in atrium, even when cirrus withdrawn. Vagina along posterior rim of cirrus pouch, then backward directed; proximal part sinuous; wall firm. Seminal receptacle poral, transversely elongate, wide, sinuous; in front of poral end of ovary. Vas deferens antero-poral, surrounding and overlapping proximal part of cirrus pouch and vagina; anterior and close to seminal receptacle. In Piciformes, Picidae. Neotropical. Type species: *M. amazonica* n. sp.

Monoliga amazonica n. sp. (Figs 19-24)

DESCRIPTION – Strobila very small; proglottides few (8-10), fully gravid ones detached; brittle; neck absent; triangular, rapidly widening when proglottides become semi-adult and adult; musculature weak. Proglottides hardly craspedote, much wider than long, often crescent-shaped with anterior concavity, rounded sides; fully gravid ones often longer than wide; pore far anterior; cortex scarce; rather wide, free medullar area in front of aporal testes. Scolex wide as much as the first segment, not well-defined from strobila, at times dome-shaped. Rostellar apparatus weakly muscular, heavily glandular; pouch subspherical, large but not reaching beyond suckers; wall thin; glandular follicles – if well preserved – radiate round retracted rostellum; anterior cavity round apex of retracted rostrellum not very deep; longitudinal external muscular bundles from the neck (generally reaching the pouch wall) seem absent or reduced to fine fibres. Rostellum proportionally small, muscular structure normal; rather narrow stem, well-defined apical pad; plunged into a glandular mass. Hooks in 1 circle, regular; few [(10?) 12-14], spaced; small but strong; blade slender, shorter than handle; rather varying in shape in the same scolex, major differences in the thickness of the stretch between guard and handle. Genital pores regularly alternate; far in front. Genital ducts dorsal to excretory vessels. Vagina posterior to cirrus pouch; porally in same horizontal plane, proximally mainly ventral. Uterus ventral, closely labyrinthine, fairly persistent, with mainly longitudinal tubes and mamillated walls, then apparently sacciform, deeply septate and, in the end, eggs loose in the parenchyma, mixed with residues of septa; it promptly occupies the whole medulla. Eggs: embryophore thin, outer layer of inner coat adheres to embryophore as a second firm layer, outer coat scarcely developed, hardly visible. Genital atrium simple, not

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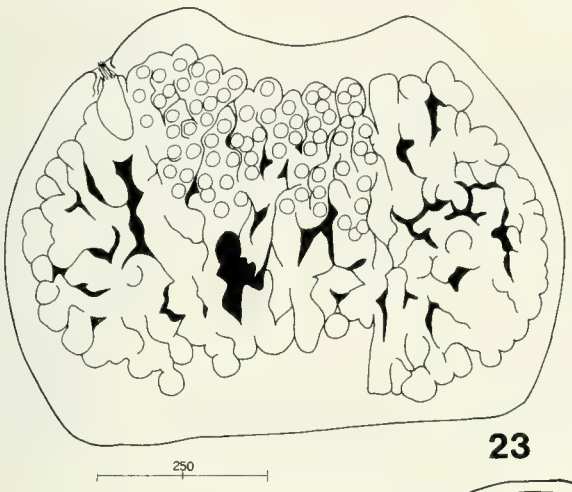
FIGS 19-22

Monoliga amazonica n. gen., n. sp.: 19, scolex; 20, hooks, two scoleces, (b) and (c) of the same scolex; 21, semi-adult proglottis; 22, fully adult proglottis, ovary larger, testes smaller than in the semi-adult one;

very deep; wall and musculature unnoticeable; unarmed; extremely reduced ductus masculinus, because the female orifice opens posteriorly in the lowest part of the atrium, just more porally than the male orifice and slightly extended along the atrium wall; furthermore, at the bottom of the atrium (not on its wall), round cirrus base, there are bristle-like spines, shorter than those of the cirrus and easily mistaken for them. Thus, in *amazonica*, there is an extreme reduction or disappearance of the ductus masculinus, but some details, well-defined in *Liga*, persist. Ovary bilobate, massive with large, irregular, not very numerous lobules; when fully ripe, the isthmus is hardly visible and the two lobes meet anteriorly; initially central, when ripe nearly wholly in the poral half of the medulla; nearing the anterior and posterior margin of the proglottis but not reaching the poral excretory vessel; backward extended laterally to vitellarium. Vitellarium close to ovary, in its posterior indenture; far in the back; smooth, with some large lobules. Testes numerous, postovarian, even lateral in semi-adult proglottides; transverse field in the posterior half of the medulla, reaching excretory vessels on both sides, more extended aporally to ovary; dorsal to vitellarium and to posterior rim of ovary; slightly proterandrous, largest size just before ovary reaches full ripeness. Cirrus pouch small, subspherical or oval; wall thin with a very delicate sleeve of circular fibres just behind orifice; nearly transverse in semi-adult proglottides, decidedly backward inclined in adult ones, at times parallel to the proglottis side. Cirrus small, short, truncated cone; wall thin; long bristle-like spines on its whole length, jutting out from pouch orifice and partly engaged in atrium even when organ withdrawn. Vagina long; distal part straight, along the posterior rim of the pouch, then sinuous, backward inclined; wall distally thin, then robust with circular fibres. Seminal receptacle poral; rather long, transversely elongate, wide, irregular, sinuous; in front of and lateral to ovarian poral lobe; sometimes hidden in the coils of the vas deferens; rather far from vitellarium. Internal vas deferens long, coiled, regular lumen; in proximal half of cirrus pouch. Vas deferens antero-poral, in the corner of the medulla; extended from anterior margin of proglottis to poral testes; in front of the poral ovarian lobe, surrounding and overlapping the proximal part of the cirrus pouch and vagina, anterior and close to seminal receptacle.

FIGS 23-27

Monoliga amazonica n. gen., n. sp.: 23, gravid proglottis; 24, atrio-genital complex, cirrus partly evaginated. *Liga ransomi* Spasskii, Reznik, 1966 (syn. *Liga punctata* (Weinland, 1856) Weinland, 1857, unavailable name because originally homonymous with *Taenia punctata* Rudolphi, 1802; *L. brasiliensis sensu* Ransom, 1909, *nec* Parona, 1901, *nec* Fuhrmann, 1907), material of Ransom, U.S.A.H.C. 4577, considered as neotype of the type species of the genus; 25, adult proglottis; 26, atrio-genital complex; cirrus partly evaginated, some bristle-like spines at the bottom of the ductus masculinus, round the cirrus base, have been drawn; 27, *Ivritaenia mukteswarensis* Singh, 1962, from Singh's drawing.



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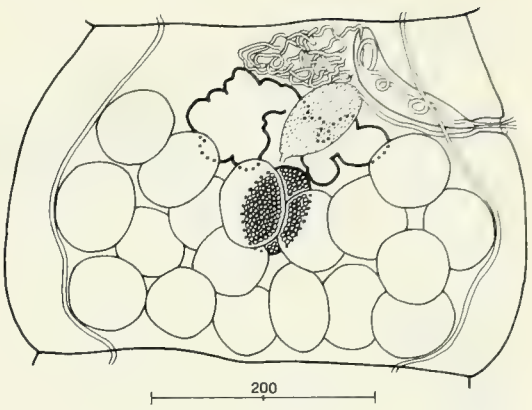

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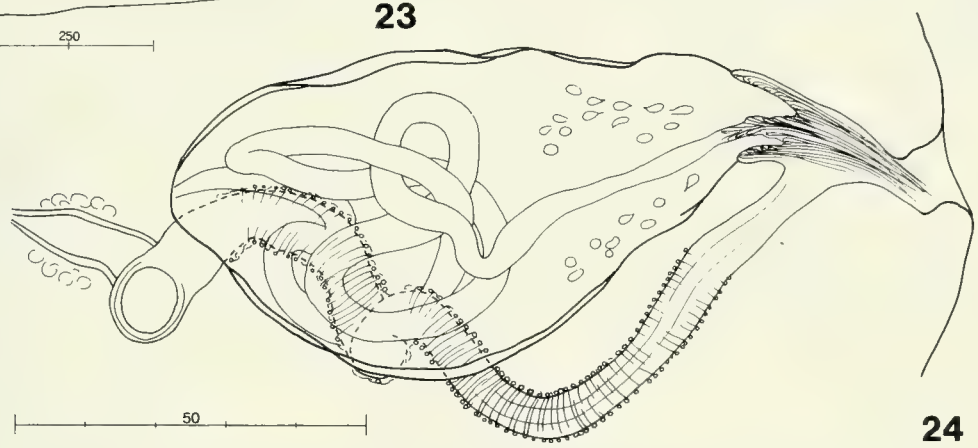

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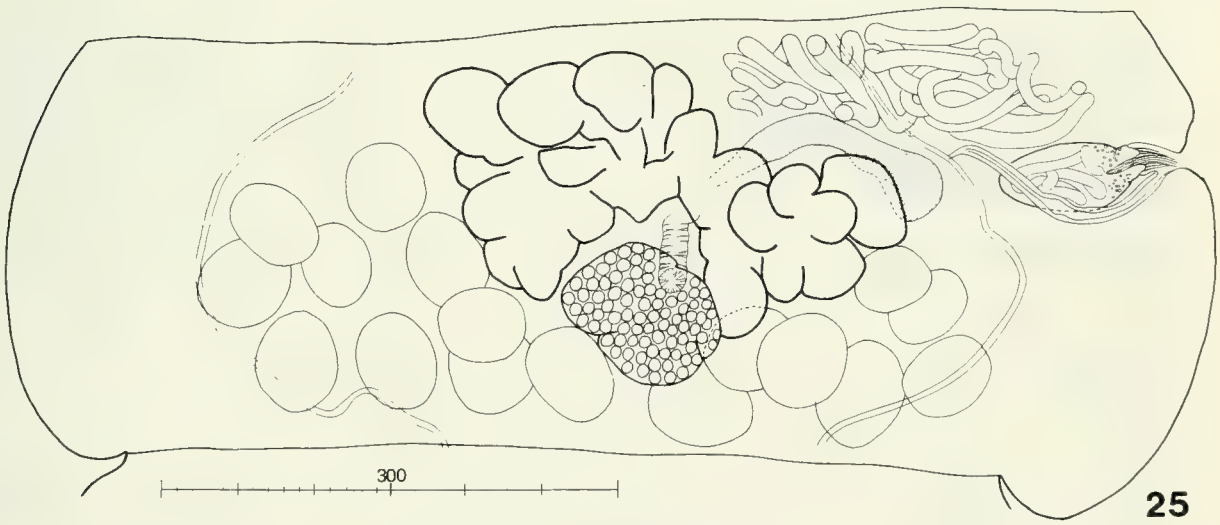

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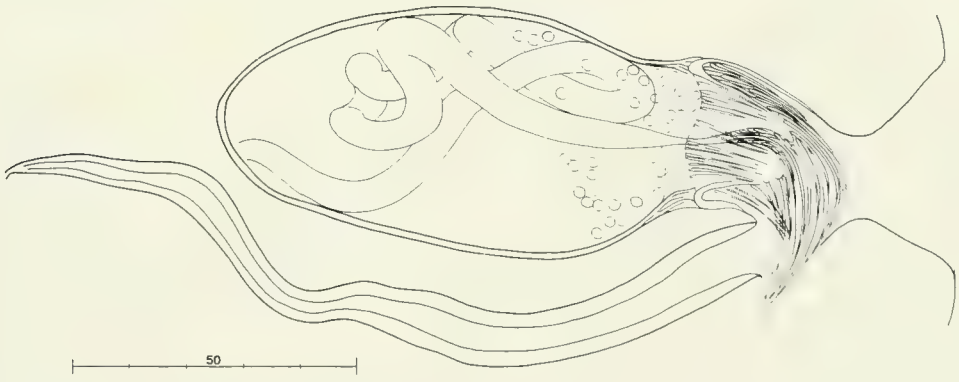

26

Numerical data

Strobila (including first gravid proglottides) about 2,3 mm; Adult proglottides (length measured along the sides) 207-275(320)x550-740(800) (n=10); Gravid proglottides from 665x835 to 730-1035x475-600 (n=10); Scolex, width 275-318 (n=3); Suckers 96-106x90-101 (n=8); Rostellum pouch (143)152-180x103-115 (n=5); Rostellum 92-104x32(stem), 38-44(apex), if not particularly contracted (n=3); Hooks, 12-14 (n scol.=3); length 19-22, even in the same scolex (n=12); Cirrus pouch (75)81-93(98)x38-46(52) (n=14); Cirrus withdrawn, tuft of bristle-like spines, 29-32x6(n=6); Testes 27-31 (n progl.=6), diameter, 51-64x37-60 (n=12); Ovary, width 220-260(320) (n=6); Vitellarium 70-83x110-133 (n=6).

Host: *Celeus flavus* (Müller, 1766).

Locality: Rio Molinowsky, Province of Madre de Dios, Peru; 3-12-1982.

Site of infection: first 1/10 of intestine.

Collection sample n° 146. Holotype and paratypes at the Museum d'Histoire naturelle of Geneva (Switzerland) MHNG 982.1860, 1862.

Discussion

Monoliga has the same hosts and morphological habitus as *Liga* Weinland, 1857 (Figs 25-26) (see Ransom 1909). It differs in the simple crown, instead of double, with few, spaced hooks, the poral position of the ovary and backward directed cirrus pouch in adult proglottides, the markedly sinuous vagina, seldom appearing in *Liga*, the backward extension of the vas deferens overlapping part of cirrus pouch and vagina. The differences from *Ivritaenia* Singh, 1962 (Fig. 27), which, like *Monoliga*, has a simple crown, regularly alternate pores and genital ducts dorsal to excretory vessels, are more subtle. *Monoliga* differs in the lower number of hooks (12-14 instead of 24), in the anatomical topography as a whole, in much wider than long proglottides, poral ovary, testicular field more extended aporally to the ovary, vitellarium situated deep in the posterior indenture of the ovary instead of clearly posterior, seminal receptacle more extended porally beyond ovary, vas deferens more poral, surrounding and overlapping the proximal part of the cirruspouch and squeezed between cirrus pouch and seminal receptacle, reaching backward almost the poral testes, cirrus pouch backward, and not forward, inclined. The differences from *Krimi* Burt, 1944 lie in regularly alternate pores, genital ducts dorsal to excretory vessels, and not in between, as mostly happens in *Krimi*, anatomical topography as a whole (Fig. 8) ovary poral, testes dorsal to vitellarium and partly to the posterior rim of the ovary and more extended aporally, backward directed cirrus pouch. Most differences from *Choanotaenia* Railliet, 1896 are the same as those from *Krimi*; it can be added, that in *Monoliga* the vagina is much more sinuous, the vitellarium has not so small lobules, the ovarian lobes are not clearly divided by a rather long isthmus, the eggs are without polar processes and not mixed with granular cells to the ripe uterus. Moreover hosts seem not to be Galliformes.

ACKNOWLEDGMENT

To Dr Claude Vaucher, with whom I had interesting discussions about the genus concept in cestodes, friendly thanks for the revision of the text.

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